CMPE283 : Virtualization
Assignment 4: Nested Paging vs. Shadow Paging

This assignment builds upon assignment 3. The purpose of this assignment is to illustrate the difference in performance when using nested paging versus shadow paging, and to illustrate the different exit frequencies and types. This lab assignment is worth up to 25 points and may be done in groups of up to **two people max.** Each team member can receive up to 25 points. It is expected that groups of more than one student will find an equitable way to distribute the work outlined in this assignment.

Prerequisites

- A working assignment 3.

The Assignment

Your assignment is as follows:

1. Run your assignment 3 code and boot a test VM using that code.
2. Once the VM has booted, record total exit count information (total count for each type of exit handled by KVM). You should do this via a sequence of queries of CPUID leaf function 0x4FFFFFFE.
3. Shutdown your test (inner) VM.
4. Remove the 'kvm-intel' module from your running kernel:
    - rmmod kvm-intel
1. Reload the kvm-intel module with the parameter **ept=0** (this will disable nested paging and force KVM to use shadow paging instead)
    - The module you want is usually found in /lib/modules/XXX/kernel/arch/x86/kvm , where XXX is the version of the kernel you build **for assignment 3 – don't make a mistake and use the one that came with the stock Linux installation.**
    - insmod /lib/modules/XXX/kernel/arch/x86/kvm/kvm-intel.ko ept=0
1. Boot the same test VM again, and capture the same output as you did in step 2.
2. Answer the questions below.

On or before the due date, turn in answers to the questions via a README-Assignment4.md file at the TOP level of your repo.

NOTE – there is no coding required for this assignment. You are just running assignment 3 again in a different configuration.

Grading

This assignment will be graded and points awarded based on the following:

- 25 points for the answers to the questions below

Submissions shall be made via pushing to your github repo. DO NOT WAIT UNTIL LATE ON THE DUE DATE, as server lags or delays may result in a late submission. Since you have three weeks to complete this assignment, I will not accept "server outage or delay" as an excuse for late submissions. If you are concerned about this, submit your assignment early. This is one area that I am extremely picky with – even 1 second late will result in a zero score.

I will be comparing all submissions to ensure no collaboration has taken place. Make sure you do not copy another group's work. If you copy another group's work, members of both groups will receive an F in the class and be reported to the department chair for disciplinary action. If you are working in a group, make sure your partners do not copy another group's work without your knowledge, as all group members will be penalized if cheating is found.

Questions

1. For each member in your team, provide 1 paragraph detailing what parts of the lab that member implemented / researched. (You may skip this question if you are doing the lab by yourself).
2. Include a sample of your print of exit count output from dmesg from "with ept" and "without ept".
3. What did you learn from the count of exits? Was the count what you expected? If not, why not?
4. What changed between the two runs (ept vs no-ept)?